

On-orbit Performance of MODIS Solar Diffuser Stability Monitor

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MODIS has 20 reflective solar bands (RSBs) in the visible (VIS), near-infrared (NIR), and short-wave infrared (SWIR) spectral regions. MODIS RSBs are calibrated on-orbit by a solar diffuser (SD) with its on-orbit degradation tracked by a solar diffuser stability monitor (SDSM). The SDSM is an instrument by itself, consisting of a solar integration sphere (SIS) with 9 individual filtered detectors covering wavelengths from 0.41 to 0.94 micrometers. It functions as a ratioing radiometer with alternate observations made of the direct sunlight (Sun view) and that diffusely reflected from the SD panel (SD view) during each scheduled SD/SDSM calibration event. Since launch, Terra and Aqua MODIS and their SDSM have successfully operated for more than 12 and 10 years, respectively. The VIIRS, on-board the newly launched Suomi National Polar-orbiting Partnership (NPP) spacecraft, has been designed and built with strong MODIS heritage and carries a similar and improved SD and SDSM calibration system. This paper provides an overview of SDSM design functions, its on-orbit calibration strategies and performance for both Terra and Aqua MODIS missions. Discussions of its on-orbit performance are focused on changes in SDSM detector responses over time and their impact on tracking SD on-orbit degradation. Also presented in this paper are lessons learned from MODIS SDSM and improvements made for the VIIRS SDSM, and preliminary comparisons of their on-orbit performance.